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(54) Mounting engine and transmission in a vehicle

(57) The engine 1 is mounted on a frame 5, which forms part of the transmission unit 2, via damping elements 17, 20 which lie in a plane which intersects the roll axis 22 of the engine 1. The transmission unit 2 is mounted on the vehicle structure via damping elements 12, 16 which lie in a plane which intersects the roll axis 21 of the engine 1 and transmission unit 2 taken in combination. This arrangement improves the isolation of vibrations and hence reduces the radiation of noise.

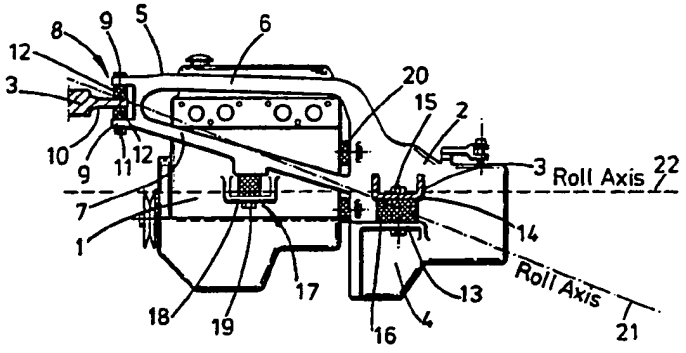

FIG.1

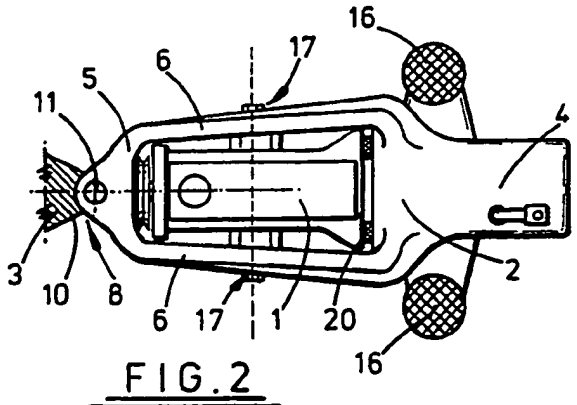

FIG.2

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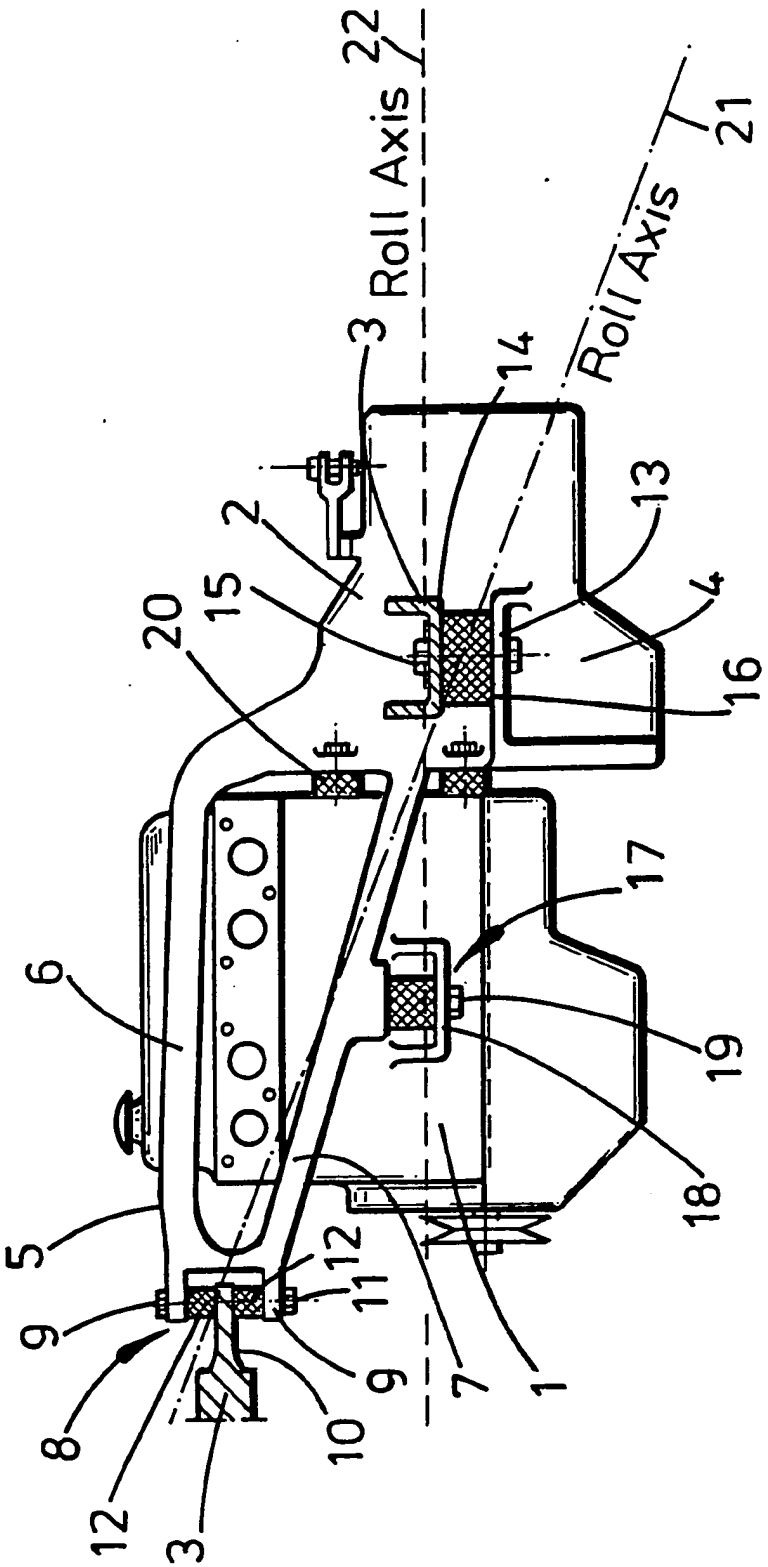
Roll Axis
22
Roll Axis
21
3
14
2
13
15
4
20
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17
6
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12
11
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12
3

FIG.1

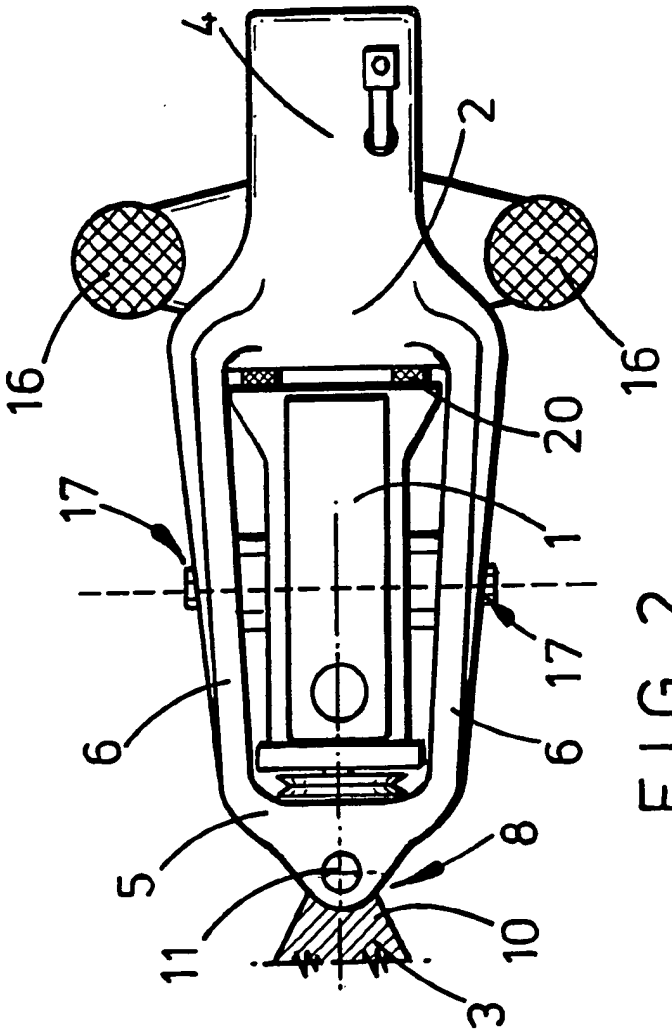

FIG.2

A DRIVE ASSEMBLY

This invention relates to a drive assembly for a vehicle, the assembly comprising a combustion engine mounted to a transmission unit which in turn is mounted to the vehicle.

In a vehicle noise is transferred from the engine to the vehicle body by both low and high frequency vibration. Low frequency vibration is generally structure borne and is transferred to the vehicle body through connections where the engine is mounted to the vehicle structure. A limited amount of high frequency vibration is also structure borne and is transferred in the same manner. Most high frequency noise radiates from the surfaces of the engine and the transmission unit. A substantial proportion of the structure borne vibration generated in the engine by combustion is transmitted to the gearbox of the vehicle via the transmission unit bell housing. Vibrations in the gearbox and transmission unit bell housing are partly transferred to the vehicle structure and partly radiated as noise from their respective surfaces.

US patent No. 4709778 describes a vehicle drive unit in which a combustion engine is supported by a transmission unit which in turn is supported by the vehicle structure. The engine is vibrationally isolated from the transmission unit by means of elastic mounting elements. The transmission unit is supported on the vehicle structure by elastic elements which provide vibrational isolation.

It is an object of the present invention to provide a drive assembly with improved vibrational isolation and consequently reduced noise radiation.

The term "roll axis" of an object is used hereinafter in the description and the claims to refer to the axis through the centre of gravity of the object about which the object would rotate with the minimum inertia.

According to the present invention there is provided a drive assembly for a vehicle, the assembly comprising a combustion engine supported on a transmission unit by engine isolation means, the transmission unit being supported on the vehicle structure by transmission unit isolation means, wherein the engine isolation

means are disposed substantially in a plane which intersects the roll axis of the engine, and the transmission unit isolation means are disposed substantially in a plane which intersects the roll axis of the engine and transmission unit combined.

Preferably the transmission unit has a frame on which the engine is mounted. The frame may also be mounted on the vehicle structure. The frame may extend from the transmission unit along the engine and may be mounted to the vehicle structure by said transmission unit isolation means adjacent either end of the engine.

In a preferred embodiment there is a first transmission unit isolation means at a vehicle mounting point adjacent one end of the engine and two second transmission unit isolation means at mounting points adjacent the transmission unit and the other end of the engine.

Preferably the engine is mounted on the frame by means of engine isolation means at either side of the engine between the first and second transmission unit isolation means.

In addition, there may be an isolation coupling between engine and transmission unit.

The frame may comprise two sets of upper and lower limbs, each set extending on either side of the engine. In this embodiment the engine isolation means may be mounted on each lower limb of the frame.

A specific embodiment of the present invention will now be described by way of example with reference to the accompanying drawings, in which:

Figure 1 is a section through a vehicle showing a side elevation of a drive assembly; and

Figure 2 is a plan view of Figure 1.

Referring now to the drawings there is shown an engine block 1 mounted to a transmission unit 2 which is mounted on a structure of a vehicle 3.

The transmission unit 2 comprises a bell housing 4 which houses a gearbox, and a frame 5 on which the engine 1 is mounted. The frame 5 has four limbs which extend from the bell housing 4, two of which extend on either side of the engine 1. On each side there is an upper limb 6 which is substantially horizontal and a

lower limb 7 which is inclined upwardly from the bell housing 4 to the upper limb 6. The lower limb 7 is connected to the upper limb 6 and the limbs of each side meet at a connection point (indicated generally by reference numeral 8) clear of the engine 1. At this point 8 there is a pair of spaced apertured mounting lugs 9. An apertured vehicle mount 10 is received in the space between the lugs 9 and a bolt 11 passes through the apertures of the lugs 9 and vehicle mount 10 to connect the frame 5 to the vehicle structure 3. Rubber vibration isolation elements 12 are positioned between the vehicle mount 10 and each lug 9 of the frame 5.

The bell housing 4 of the transmission unit 2 has a flange 13 on either side close to where each lower limb 7 is joined to the bell housing 4. Each flange 13 has an aperture and is connected to a vehicle cross member 14 by a bolt 15 via a vibration isolation element 16.

At an intermediate position along the length of each lower limb 7 there is a side connector 17 by which the frame 5 is connected to the engine 1. A vibration isolation element 18 is located between the engine 1 and the connector 17 of the lower limb 7. A bolt 19 connects the limb 7 to the engine 1.

In addition to the side connectors 17, the engine 1 is connected to the transmission unit 2 by means of a rubber connection element 20 located between the two.

It can thus be seen that the engine 1 is vibrationally isolated from the transmission unit 2 by isolation elements 18 at the side connectors 17 and by the connection element 20. The transmission unit 2 is in turn vibrationally isolated from the vehicle structure 3 by means of fore and aft vibration isolation elements 12,16.

The fore and aft vibration isolation elements 12,16 are positioned such that they lie substantially in a plane which intersects the roll axis 21 of the engine 1 and transmission unit 2 in combination. The side mounted isolation elements 18 are positioned such that they lie substantially in a plane which intersects the roll axis 22 of the engine 1 only. The use of the separate vibration isolation elements in this manner provides for effective isolation of both low and high frequency structure borne noise.

The spaced positions of the isolation elements and their mountings provides for more stability in the assembly. The positions of the isolation elements and their mountings may be varied to suit the particular vehicle.

Using the assembly as described, the engine torque is reacted without significant resonances in the speed range of the vehicle, and the flexible connection between the engine and the transmission unit reduces transmission of high frequency vibration from the engine to the gearbox. The arrangement as a whole reduces the noise from the engine being transmitted to the transmission unit and to the vehicle structure and thus limits the amount of potential noise which may be radiated from the surfaces of the transmission unit, the bell housing and the vehicle structure.

By using the particular transmission unit frame 5 design as described the isolation elements may be arranged in planes which intersect the respective roll axes 21, 22 as described above. This arrangement allows both the engine block 1 and the combination of the engine block 1 and the transmission unit 2 to vibrate freely about their respective roll axes 21, 22 which eliminates undesirable reaction forces in the mountings of the engine and transmission unit.

CLAIMS

1. A drive assembly for a vehicle, the assembly comprising a combustion engine supported on a transmission unit by engine isolation means, the transmission unit being supported on the vehicle structure by transmission unit isolation means, wherein the engine isolation means are disposed substantially in a plane which intersects the roll axis of the engine, and the transmission unit isolation means are disposed substantially in a plane which intersects the roll axis of the engine and transmission unit combined.

2. A drive assembly according to claim 1, wherein the transmission unit has a frame on which the engine is mounted.

3. A drive assembly according to claim 2 in which the frame is mounted on the vehicle structure.

4. A drive assembly according to claim 2 or 3, wherein the frame extends from the transmission unit along the engine and is mounted on the vehicle structure by said transmission unit isolation means adjacent either end of the engine.

5. A drive assembly according to any one of claims 2 to 4, wherein there is provided a first transmission unit isolation means on said frame at a vehicle mounting point adjacent one end of the engine and second transmission unit isolation means at a position adjacent the transmission unit and the other end of the engine.

6. A drive assembly according to claim 5, wherein there are two second transmission unit isolation means.

7. A drive assembly according to claim 5 or 6, wherein the engine is mounted on the frame by means of engine isolation means at either side of the engine between the first and second transmission unit isolation means.

8. A drive assembly according to any one of claims 2 to 7, wherein the frame has two sets of upper and lower limbs, each set extending on either side of the engine.

9. A drive assembly according to claim 8, wherein the engine isolation means is mounted on the lower limb of the frame.

10. A drive assembly according to any preceding claim in which a damper coupling is located between engine and transmission unit.

11. A drive assembly substantially as hereinbefore described with reference to the accompanying drawings.

Patents Act 1977 Examiner's report to the Comptroller under Section 17 -7- (The Search report)	Application number GB 9302235.8
Relevant Technical Fields (i) UK Cl (Ed.M) B7H (HDK, HDN) (ii) Int Cl (Ed.5) B60K 5/00, 5/12, 17/04	Search Examiner J L TWIN Date of completion of Search 5 APRIL 1994
Databases (see below) (i) UK Patent Office collections of GB, EP, WO and US patent specifications. (ii)	Documents considered relevant following a search in respect of Claims :- 1-11

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A:	Document indicating technological background and/or state of the art.	**&:**	Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages	Relevant to claim(s)
A	US 4709778 (PORSCHE)	1

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